that it will be reproduced in a way that will leave no question as to his devising capacity or sanity. It is already possible by ingenious optical contrivances to throw stereoscopic photographs of people on screens in full view of an audience. Add the talking phonograph to counterfeit their voices, and it would be difficult to carry the illusion of real presence much further.

NOTES

MR. SORBY is busy perfecting his new method of studying minerals. Some very remarkable properties are still unexplained, and only the other day Mr. Sorby made a very great fresh advance in the subject.

IT is probable that Sheffield will be chosen for the meeting of the British Association in 1879. Nottingham was to have been the place of meeting, but a difficulty has arisen respecting the meeting there, and Sheffield has been unofficially written to. The matter is being warmly taken up by some of the principal townsmen, and there can be no doubt with a successful result.

A PHOTOLITHOGRAPHIC plate of the primary triangulation of the United States Geological and Geographical Survey of the Territories, carried on during the summer of 1877, by Mr. A. D. Wilson, chief topographer, has just been published by the United States Geological Survey, under the charge of Dr. F. V. Hayden. The area covered by these triangles extends from Fort Steele, in Wyoming Ty., westward to Ogden, in Utah Ty., a distance of about 260 miles, and north as far as the Grand Teton, near the Yellowstone National Park, including Freemont's Peak of the Wind River Range of the Rocky Mountains. The area embraces about 28,000 square miles, and within it, twenty-six primary stations were occupied, and their positions accurately computed. Besides these occupied stations, a large number of mountain peaks were located, which in the future will be occupied as points for the extension of the topographical work of the Survey. A base line was carefully measured near Rawlin's Springs, on the line of the Union Pacific Railroad, and from this initial base the work was extended north and west to the valley of Bear River, in Idaho Ty. Here a check base was measured, and the system expanded to the neighbouring mountain peaks to connect with the triangulation as brought forward from the first-mentioned base. Along the line of the Union Pacific Railroad the work was connected at six points with the triangulation system of Clarence King's 40th parallel survey. In addition to the importance of this sheet as the base work of the season's topographical work, it presents a most striking feature in the number of remarkably long sights which were taken from the summits of some of the most lofty mountains in the area explored. Many of these sights were over 100 miles in length, while some reach a distance of 135 miles. From Wind River Peak all the prominent points in the Big Horn Mountains were sighted, also the loftier peaks of the Uinta Mountains; the former are located 165 miles to the north-east, while the Uinta Mountains are situated about the same distance to the south-west. As these ranges were not in the scope of the season's work, they are not given on the chart.

THE *Annual Report of the Smithsonian Institution* for the year 1876, which has recently been published, is of general interest. The Institution continues to carry on its usual work with vigour and efficiency. Two important volumes of the Smithsonian Contributions to Knowledge, xx. and xxi., have been issued. The former on the Winds of the Globe, by Prof. Coffin, consisting of 781 quarto pages, is considered to be the most important contribution to knowledge which the Institution has given to the world. It presents a rich mine of information for the use of meteorologists, the physical geographer, and the mariner. Volume xxi. contains the following articles, viz.:—(1) Statements and Expositions of Certain Harmonies of the Solar System, by Prof. Alexander. (2) On the General Integral of Planetary Motion, by Prof. Newcomb. (3) The Haidah Indians by J. G. Swan. (4) Tables of Atmospheric Temperature in America. There has been published an important work on the Antiquities of Tennessee, by Dr. Joseph Jones, and another on the Archæological Collections of the U.S. National Museum; also a supplement to Prof. F. W. Clarke's work on the "Constants of Nature," consisting of tables of specific gravities, boiling and melting points, specific heats, &c. Large additions have during the year been made to the collections of the National Museum in charge of the Institution. In the Appendix to the Report there is a translation of the eulogy on Gay-Lussac by M. Arago; a biographical sketch of Dom Pedro II.; a translation of an important paper of Prof. Pilar on the Revolutions of the Earth's Crust, which will be read with interest by students of physical geography and geology. The subjects discussed in this article are the origin of the earth, central heat, the fluid envelope, organisms, ice, with a concise account of the theory of secular changes of climate resulting from changes in the eccentricity of the earth's orbit, antiquity of man, &c. Then follows a paper by Dr. D. Kirkwood on the Asteroids between Mars and Jupiter. But the article which will probably attract most attention is one by Mr. W. B. Taylor on Kinetic Theories of Gravitation. In this memoir, occupying about eighty pages, is given an interesting historical account of all the principal theories which have been advanced since the time of Newton to the present day to explain the nature of gravitation. Villemot, 1707; Bernouilli, 1734; Le Sage, 1750; Euler, 1760; Herapath, 1816; Guyot, 1832; Faraday, 1844; Seguin, 1848; Boucheporn, 1849; Lamè, 1852; Waterston, 1858; Challis, 1859; Glennie, 1861; Keller, 1863; Tait, 1864; Saigey, 1866; Croll, 1867; Leray, 1869; Boisbaudran, 1869; Guthrie, 1870; Crookes, 1873. These theories are all criticised with considerable acuteness. Mr. Taylor lays down six fundamental characteristics of gravity with which, he asserts, every theory must agree. But unfortunately it is in reference to the truth of some of Mr. Taylor's postulates that the greatest diversity of opinion exists. No kinetic theory of gravitation can fulfil his six conditions. Mr. Taylor seems to misapprehend some of the theories in important points, particularly those of Le Sage and Croll. The Appendix concludes with a number of interesting papers on Ethnology.

WE have already referred to Prof. A. Agassiz's intention of carrying out a series of researches in the Gulf of Mexico. With an assistant he is to be accommodated on board the United States Coast Survey steamer *Blake*, which has just sailed on a surveying cruise that will occupy this winter in the Gulf of Mexico. By a study of the animals dredged from the bottom of the Gulf, Prof. Agassiz will be enabled to make important comparisons with the fauna of the Atlantic, and especially as to growth, habits, migrations, and changes of living forms found in the waters near the British Islands and the Scandinavian Peninsula. The expedition is under the command of Lieutenant-Commander Charles D. Sigsbee, United States Navy, who has had several years experience on coast survey duty, and has been notably successful in deep-sea soundings.

NEW YORK will in all probability have a magnificent new Zoological Garden in Central Park before the end of another year. The Park Commissioners have little doubt that the amount of money, 300,000 dollars, necessary to make a commencement, will be subscribed without difficulty.

THE death is announced of Mr. Robert Hollond, a gentleman formerly well-known in connection with aeronautics.

THE Rev. Horace Waller writes to the *Times* that Col. Mason has been round Lake Albert Nyanza in a steamer, and corroborates the fact of its being a comparatively small land-locked lake. Col. Mason is in the service of the Khedive.

Mr. Stanley has arrived in Egypt, and is to spend a few days at Cairo. On New Year's Day he was to be entertained at a banquet by Sir George Elliot, M.P., to which the principal English and American visitors and residents were invited.

The African Association presided over by the King of the Belgians has learnt by telegram that its travellers have safely reached Zanzibar.

At a recent meeting of the Liverpool Historic Society, Mr. T. Glazebrook Rylands, F.S.A., read an important paper on "Ptolemy's Geography of the Coast from Caernarvon to Cumberland (including Cheshire and Lancashire). The paper was the preliminary result of extensive and long research, during which the author has found out that previous writers have examined Ptolemy's work carelessly or inadequately, and greatly misrepresented his *data*. It has, for example, been inferred for centuries that the Mersey was unknown to Ptolemy, and that the river known as Belisama was identical with the Ribble. This has led to further deductions of an erroneous character; as, for example, that there was a wide sheet of water making the mouths of the Mersey and the Dee undistinguishable, while two islands in it reared their heads, viz., Wallasey, separated by a branch of the tide through Wallasey Pool, and Wirral, separated by a strait almost coincident with the canal from Chester. Mr. Rylands believes—and there can be little doubt of the fact—that he has ascertained the ideas of Ptolemy and verified his measurements and mode of projection in a way wholly unknown to former inquirers. He has thus explained apparent anomalies and corrected misunderstandings of former writers. Commencing southwards at Caernarvonshire, he has verified the positions from beyond Pwlhelli round by Caernarvon and Conway to the Dee; he has verified the positions of the Mersey and the Ribble, and all along the coast to St. Bee's Head, in Cumberland. In several instances where it was thought Ptolemy was in error, Mr. Rylands has shown he is correct, and it is a matter of surprise that where we should expect approximate truth only, the more rigid tests give more accurate results.

The Bristol Naturalists' Society appears to be in a flourishing condition. It has recently added to its organisation a Physical and Chemical "Section," of which Dr. W. A. Tilden is secretary and Mr. P. J. Worsley president. The recent meetings of the Society have been more largely attended, and there appears to be a revived interest in physical science in the ancient city.

M. Gauthier Villars has just published a new edition of a highly interesting old book, "Lectures on Chemical Philosophy," delivered at the Collége de France in 1836 by M. Dumas. In this curious work all the prevalent ideas in chemistry were initiated. Not a single sentence has been altered, yet M. Dumas' lectures seem quite fresh and young, ready to be used by students in the highest schools. They were collected by M. Bineau, a gentleman who died twenty years ago, after having been a professor in the Lyons Faculty of Sciences.

The sittings of the enlarged council of the Paris observatory came to an end last week. The resolutions come to, of which we have already given the substance, have been sent to M. Bardoux, the Minister for Public Instruction. The International Meteorological Service entered, on January 1, the twenty-first year of its existence, and will continue connected with the Paris Observatory, where it was established by M. Leverrier in 1857. The present head of the service is M. Front, a physicist connected with the service for many years, and trained by Leverrier himself. The first physicist-*adjoint* is M. Moureau, formerly a schoolmaster, whom Leverrier remarked for his zeal and assiduity in meteorological researches and observations. The great astronomer required no other scientific qualifications than intelligence and instruction obtained by personal exertion. He turned away many doctors in science and pupils of the highest schools who were wanting in the requirements he was anxious to secure, and sought to find them even in the humblest stations of life.

Mr. John Fielding, of Todmorden, has just presented to the Aquarium at Westminster two specimens of *Proteus sanguineus*, obtained by his courier, C. F. Kohl, from the grotto of Adelsburg. They are said to be the first shown in England. A specimen of *Menobranchus lateralis* has been on view for some little time.

A most unfortunate series of disasters followed Mr. Carrington's endeavours to bring to London a collection of specimens of the Mediterranean fauna. Dr. Eisig, of the Naples Aquarium, offered him every facility, suggested localities, and placed some store-tanks at his service. A collection of fish zoophytes and corals was made, and seven tanks were fitted up on a cargo steamer to transport them to England. Shortly after starting a thunderstorm was encountered, the ship was struck by lightning, and the contents of two metal tanks were at once destroyed. Among other things a fine collection of mureen eels averaging 2 feet in length was thus lost. Rough weather for a day or two caused further deaths. After leaving Gibraltar the change of temperature proved excessively fatal, the bright-coloured animals suffering most. The heavy weather in the Channel broke some of the other tanks, so that but few animals reached England alive. Mr. Carrington, however, arranged for supplies with agents at Naples, Messina, Palermo, Valentia, Gibraltar, Tangiers, and Lisbon.

Mr. B. Ralph, of Launceston, Cornwall, sends us a ripe strawberry which he gathered on December 29 from a hedge about 400 feet above sea-level. Pink strawberry blossoms, he states, are not uncommon. The thermometer stood at 50° in the shade. Bar. 29·2, with a west wind. Many of the commoner hedgeflowers linger on, such as lychnis and geranium. He also incloses some primroses, blossoming in an exposed situation outside his window.

Two somewhat forcible shocks of earthquake were felt at Bologna on December 23, and a slight one at Alicante on the preceding day.

Prof. Barrett, in a recent lecture on the telephone, gave a receipt for making a cheap one. Take a wooden tooth-powder box and make a hole about the size of a half-crown in the lid and the bottom. Take a disc of tinned iron, such as can be had from a preserved meat tin, and place it on the outside of the bottom of the box, and fix the cover on the other side of it. Then take a small bar-magnet, place on one end a small cotton or silk reel, and round the reel wind some iron wire, leaving the ends loose. Fix one end of the magnet near, as near as possible without touching, to the disc, and then one part of the telephone is complete. A similar arrangement is needed for the other end. The two are connected by the wire, and with this Prof. Barrett says he has been able to converse at a distance of about 100 yards.

M. Bardoux, the new Minister of Public Instruction in France, has held a reception of the several heads of his department and *employés* of the central administration. He delivered a speech insisting upon the necessity for a Republican Government to educate the people, as a good system of public education is the strongest basis on which any Republic can be safely established. According to the *XIX. Siècle* M. Bardoux is not only preparing a Bill for establishing gratuitous elementary education, but also for organising a higher elementary education.

Prof. Pfaundler communicated in a recent session of the Vienna Academy the results of some experiments undertaken to decide the question as to the smallest absolute number of vibrations capable of producing a sound. By means of a siren with two openings for blowing, he finds that two isolated vibrations are capable of producing a tone which, by repetition, becomes audible.

The Meteorological Society of Paris has elected as president M. Hervé Mangon, professor of Agriculture at the Conservatoire des Arts et Métiers.

The Postal and Telegraph services are to be united in France, as they have been already in England, under a single direction. The first director of the complex organisation will be M. Cocheris, one of the staff of the *Temps* and a well-known writer on matters of political economy.

At the last meeting, December 19, 1877, of the Russian Geographical Society, M. Mushketov made a very interesting communication on his last journey in the Tian Shan and to the Pamir, where he visited some places never before visited by European travellers. His researches enable us to correct many imperfections in the works of Gordon and Stoliczka, and to obtain many new and important data. A complete geological sketch of the Pamir highlands will soon be published by M. Mushketov. At the same meeting the secretary gave an account of a new expedition to Central Asia, which will start from St. Petersburg at the beginning of this year, under the leadership of Prof. A. E. Middendorff. The expedition has especially in view the study of the agricultural conditions of Turkistan, and the well-known traveller, zoologist, and practical agriculturist who is at the head of the expedition, will be supported in his work by MM. Smirnoff and Russow.

At the meeting, December 15, of the St. Petersburg Society of Naturalists Prof. Kessler referred to the fishes brought this year by M. Polyakoff from the lakes Ala-Kul and Balkhash. In addition to the seven species which were known before in the Central-Asian fauna he has discovered four new ones, one of which is the interesting fish described by the inhabitants as *Marenker* (its zoological description will soon appear), the flesh and caviare of which are poisonous.

Prof. Berthelot, of Paris, is probably the most prolific chemist of the day. We notice in the two last numbers of the *Annales de Chimie et de Physique*, the two last numbers of the *Comptes Rendus*, and the last *Bulletin de la Société Chimique de Paris*, thirty-two various articles under his name. Berthelot's researches are, however, confined to thermal and physical chemistry, and are not delayed by the analytical operations attendant on other branches of chemical investigation.

Capt. J. O. Lunginers, of the Danish vessel *Lutterfeld*, communicates to a Copenhagen paper an interesting account of a novel experience which occurred on December 10, 1876, while on a voyage to Valparaiso. The vessel was at this time in the neighbourhood of Terra del Fuego, about 140 miles from Magellan's Straits, when early in the morning it narrowly escaped collision with an island where no trace of land appeared on the charts. The vessel hove-to until daylight, when the captain proceeded with a boat's crew to the new island, which had gradually diminished in size since the first observation. Around the conical rocky mass the water was hissing, and although no smoke appeared, it was found to be too highly heated to permit of landing. The sinking continued slowly, until at eight o'clock the island was completely submerged, and an hour later the vessel passed over the spot where it had disappeared.

The December Session of the Berlin Geographical Society was occupied by a long and interesting address from Dr. F. M. Hildebrandt, on the results of his late African explorations. We have already alluded in a late number to the unfortunate result of the expedition to the snow-clad mountains of equatorial Africa, when the explorer was compelled to return with Mount Kenia fairly in sight. The heroism of Dr. Hildebrandt in battling with danger and disease in manifold forms is only approached by the adroitness and ingenuity which characterised his dealings with the natives. Among the Hataitas he was regarded as a magician, and was forced to pronounce incantations on the unfruitful fields. For this purpose, at his request, specimens of all the plants and animals in the vicinity were gathered by the tribe, and after having served as a "fetish," were carefully packed away in the collections. On another occasion he was attacked by several hundred natives, who beat a hasty retreat, when the explorer advanced towards them armed with a photographic camera. Despite the constant succession of misfortunes accompanying Dr. Hildebrandt during his two years' explorations in Africa, he has succeeded in gathering together a large and valuable collection of anthropological and botanical specimens especially, from Cape Gardafui and the Comoro island Johanna. A number of new species and genera, particularly of aromatic plants, were discovered in the former locality.

The additions to the Zoological Society's Gardens during the past week include two Lions (*Felis leo*) from Upper Nubia, presented by Mr. John Baird; a Green Monkey (*Cercopithecus callitrichus*) from West Africa, presented by Mr. J. Scott; a Bonnet Monkey (*Macacus radiatus*) from India, presented by Mr. J. H. Thompson; a Common Thicknee (*Œdicnemus crepitans*), European, presented by Mr. F. Möll; a Macaque Monkey (*Macacus cynomolgus*) from India, deposited; a Collared Fruit Bat (*Cynonycteris collaris*), a Geoffroy's Dove (*Peristera geoffroii*), bred in the Gardens.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

Oxford.—An examination for a Radcliffe Travelling Fellowship will be held on February 11. Candidates should forward notice of their intention to offer themselves, on or before January 15, to Dr. Acland.

An examination will be held at Queen's College on April 30 to fill up an open scholarship in natural science, of the value of 90*l.*, tenable for five years.

London.—We learn that in consequence of the success attending the course of Lectures on Physiology now being delivered at the Working Men's College, Great Ormond Street, by Mr. T. Dunman, the Council of that Institution have arranged for the delivery, by the same gentleman, of a supplementary advanced course of about sixteen lectures, the first of which will be delivered on Friday, January 18. The lectures will be accompanied by practical demonstrations. Mr. Dunman has been appointed to the lectureship in physiology at the Birkbeck Institution, recently vacated by Dr. Aveling.

Manchester.—Mr. M. M. Pattison Muir, F.R.S.E., Assistant-Lecturer in Chemistry, and Demonstrator in the Laboratory of the Owens College, has been appointed Prælector in Chemistry at Gonville and Caius College, Cambridge.

Berlin.—We notice in the report of a late session of the Prussian House of Deputies a very vigorous presentation, by Prof. Mommsen and Prof. Virchow, of the necessity for a new building for the royal library. This valuable collection of books—over 700,000 in number—is the largest in Germany, and increases so rapidly that the present quarters in the Imperial Palace are most inadequate. The Government shows an inclination to remedy the evil, and it is to be hoped that this chief store of mental pabulum for the Berlin student will soon be provided with a house of its own, and the much-needed catalogue of its treasures finally be published.